The COLLINS 75A-3

AMATEUR RECEIVER with MECHANICAL FILTER

ANOTHER

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ACHIEVEMENT

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NOW

After many years of intensive research, Collins announces development of the mechanical filter, now combined with the unique features of the 75A-2,

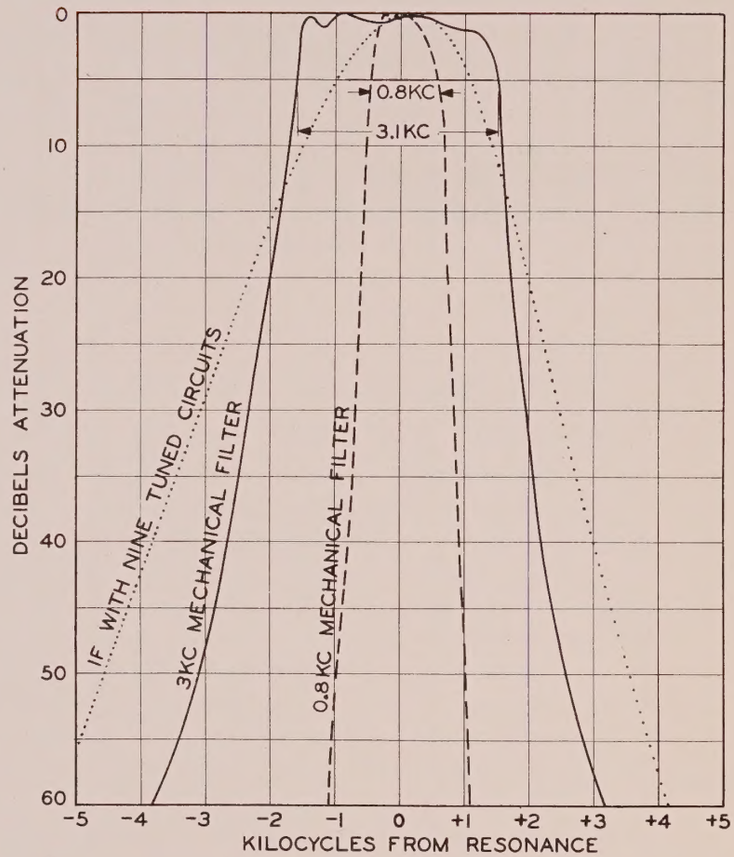
. . . to bring to Amateur Radio

the 75A-3 Receiver

THE selectivity curves shown here tell the story of a new concept in receiver performance. The mechanical filter, recently developed by Collins and incorporated in the 75A-3 receiver, represents an entirely new approach to the attainment of selectivity. Using resonant mechanical elements rather than tuned electrical circuits, the mechanical filter gives a close approach to the ideal rectangular selectivity curve. Each 75A-3 receiver has plug-in provisions for two mechanical filters. A 3 kc. filter is standard factory equipment and when still greater selectivity for c.w. operation is desired, an 800 cycle unit may be plugged in as an optional accessory. With both the 800 cycle and 3 kc. filters in the receiver, a switch on the front panel provides instantaneous choice of selectivity characteristics. When required, the crystal filter may also be switched into the circuit to notch out interfering signals and heterodynes.

The nearly flat top and sharp cutoff at the sides of the selectivity curve of the 3 kc. mechanical filter permit a.m. signals to be tuned so as to accept the carrier and either one of the sidebands at will, while the other sideband, and any signals that are interfering with it, are eliminated. Full advantage may also be taken of the benefits of local b.f.o. carrier reinsertion on a.m. as well as s.s.s.c. signals.

Because of the mechanical filter's straight-sided selectivity curve, the 75A-3 receiver can be tuned near a strong signal without responding to that signal. As the receiver is tuned across the band, signals suddenly appear and disappear. This is because of the absence of broad skirts which "drag out" the tuning of receivers that have conventional i.f. strips.



All of the proven features of the 75A-2 have been retained in the 75A-3. These features, such as crystal controlled front-end, highly stable variable-frequency oscillator, and accurate dial calibration, to name but a few, combine with the new Collins mechanical filter to give unequalled performance.

The curves above show a comparison between the selectivity curve of a good i.f. strip using nine tuned circuits, and typical selectivity available in a Collins 75A-3 receiver incorporating an 800 cycle and a 3 kc. mechanical filter. When both mechanical filters are installed in the receiver, either one may be selected by the flip of a switch. These curves show performance without the crystal filter.

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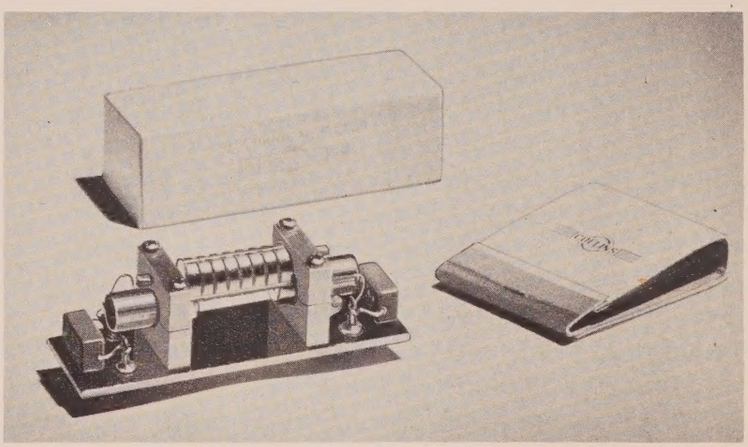
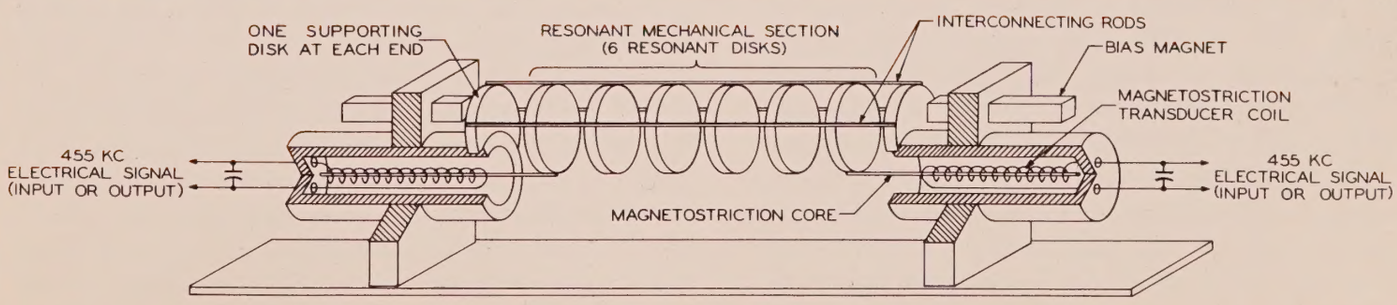
The NEW Collins MECHANICAL FILTER and How it works in your 75A-3 Amateur Receiver

The mechanical filter is a resonant mechanical device in the 75A-3 receiver's 455 kc. i.f. strip. Unlike the crystal filter, the mechanical filter remains in the circuit at all times. As shown here, it consists of three general sections: an input transducer, a mechanically resonant section consisting of a number of metal disks, and an output transducer. A 455 kc. electrical signal applied to the input terminals is converted into a 455 kc. mechanical vibration at the input transducer by means of magnetostriction. This mechanical vibration travels through the resonant mechanical section to the output transducer, and is converted, by magnetostriction, to a 455 kc. electrical signal which appears at the output terminals. There is no mechanical motion except for the imperceptible vibration of the metal disks. The mechanical filter requires no adjustment.

F455B-31 3 kc. Mechanical Filter Characteristics

Operating frequency	455 kc.
Nominal band width at 6 db. down	3.1 kc.
Shape factor (6 db. to 60 db.)	less than 2.25/1
Peak-to-valley ratio	less than 3 db.
Insertion loss	less than 26 db.
Overload input voltage	15 volts
Operating temperature range	–30°C to 80°C
Vibration	Complies with Spec AN-E-19
Input and output impedance	8000 ohms resistive at resonance
Case size	1" x 15/16" x 2-13/16"




ONE SUPPORTING DISK AT EACH END
RESONANT MECHANICAL SECTION (6 RESONANT DISKS)
INTERCONNECTING RODS
BIAS MAGNET
MAGNETOSTRICTION TRANSDUCER COIL
455 KC ELECTRICAL SIGNAL (INPUT OR OUTPUT)
455 KC ELECTRICAL SIGNAL (INPUT OR OUTPUT)
MAGNETOSTRICTION CORE

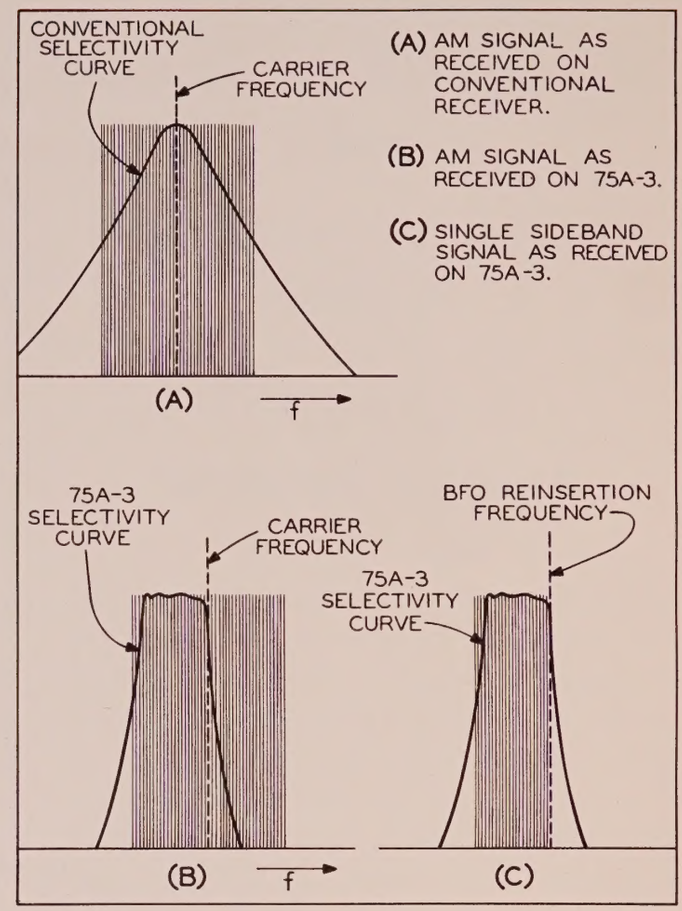
COLLINS

The nearly rectangular selectivity curve of the 75A-3 permits tuning procedures that are ideal for A.M. or SINGLE SIDEBAND

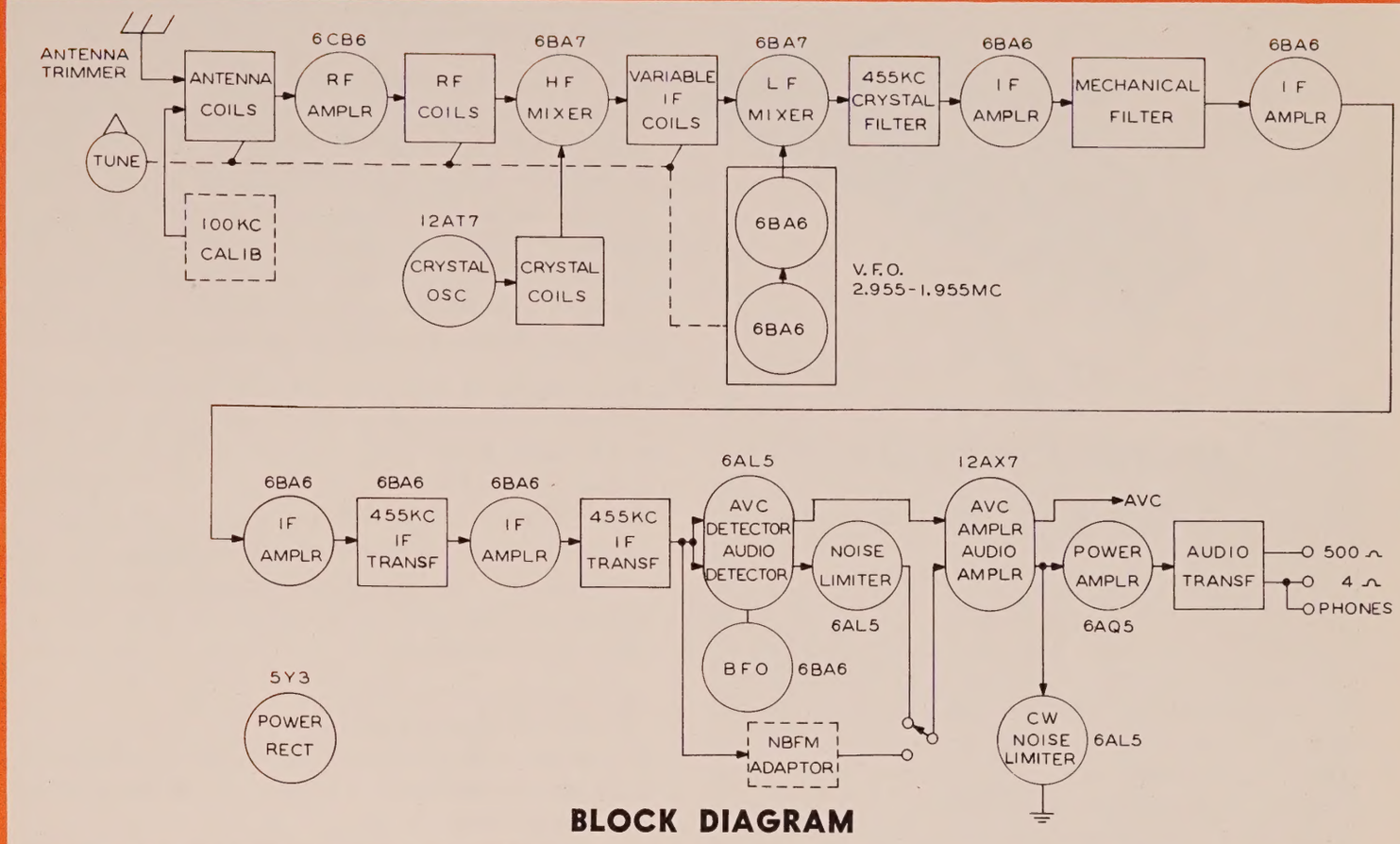
SELECTIVITY AND TUNING

A receiver with conventional i.f. strip is usually tuned as shown in curve A at right. The carrier is set at the center of the selectivity curve, thereby dividing the receiver's bandwith between the two sidebands of the received signal. Since all of the transmitted intelligence is included in each sideband, a substantial reduction in heterodynes and other interference can be attained by narrowing the receiver's bandwidth and tuning to only one sideband and the carrier as shown in curve B. However, this cannot be done with the conventional rounded i.f. curve, illustrated at A, because tuning the receiver to a sideband moves the carrier down onto the side of the selectivity curve and reduces the level of the carrier below the level of one of the sidebands. This causes the familiar distortion (overmodulation at the receiver's detector) that always results when a conventional receiver's passband is not centered on the carrier.

Therefore, the bandwidth of the conventional receiver must be split between two sidebands while the 75A-3 receiver, with its nearly rectangular selectivity curve, is designed to be tuned as shown in curve B. Only the carrier and one sideband are included in the receiver's passband. The sideband that is most nearly in the clear is selected, permitting the other sideband, and any signals that are interfering with it, to be eliminated. The 75A-3 is normally tuned to one side of the received signal until the higher audio frequencies are heard, indicating that the receiver is set up as shown in curve B. When tuned in this manner, the 3-kc mechanical filter in the 75A-3 passes the same audio bandwidth as a conventional receiver having a bandwidth of approximately 6 kc.



As shown in C above, the width and shape of the 75A-3 selectivity curve is ideally suited to s.s.s.c. reception. This selectivity curve, combined with the stability made possible by a crystal-controlled high-frequency mixer and very stable low-frequency oscillator, makes the 75A-3 an excellent s.s.s.c. receiver. When tuning s.s.s.c. signals on the 75A-3, turn on the b.f.o., set the audio gain at maximum, and adjust the volume with the r.f. gain control. Where the lower sideband is being transmitted, as is usually the case on 75 meters, set the b.f.o. pitch-control knob about three-sixteenths inch to the right of the +1 position. This sets the b.f.o. carrier at the high edge of the sideband, as shown in C above, and about 1500 cycles above the receiver dial setting. When the high sideband is being transmitted, the b.f.o. knob must be set to a position to the left of the –1 position in order to place the b.f.o. carrier at the low edge of the sideband. Since the b.f.o. carrier is inserted after the signal has passed through the mechanical filter, the carrier frequency does not necessarily have to be included in the i.f. passband. With the receiver set up as outlined above, carefully turn the main tuning knob until the voice being transmitted by the single-sideband station sounds natural.



BLOCK DIAGRAM

CIRCUIT

As shown in the block diagram, the 75A-3 retains the unique features of the 75A-2. A 6CB6 r.f. stage feeds the 6BA7 high-frequency mixer; a 12AT7 crystal oscillator, using a different crystal on each band, provides the injection frequency. The resulting variable intermediate frequency is coupled through the high-frequency variable i.f. coils into a 6BA7 low-frequency mixer. Low-frequency injection voltage is provided by a 6BA6 variable-frequency oscillator and 6BA6 amplifier. The v.f.o. is hermetically sealed and temperature compensated. Its rugged mechanical construction does not allow noticeable frequency changes with mechanical vibration.

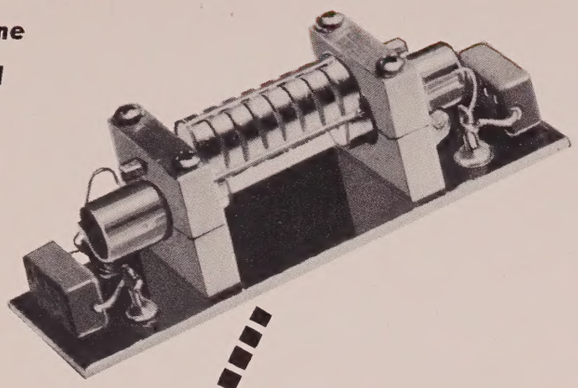
A crystal filter follows the low frequency mixer. The mechanical filter is inserted after the first 6BA6 455 kc. i.f. amplifier and is followed by three more 6BA6 i.f. amplifiers. The receiver's i.f. selectivity curve is shaped by the mechanical filter. Two i.f. transformers are used, but they serve as coupling devices and are made too broad to affect the receiver's selectivity curve. The 6BA6 i.f. amplifiers are followed by a 6AL5 detector and a.v.c. rectifier. Half of a 12AX7 dual-triode acts as an a.v.c. amplifier. The other half is an audio amplifier which drives the 6AQ5 audio output tube. A 6AL5 is used in a series noise-limiter circuit for 'phone reception and another 6AL5 is a shunt c.w. noise limiter. The r.f., high-frequency mixer, high-frequency i.f., and low-frequency v.f.o. are gang-tuned and coupled to the linear main-tuning dial.

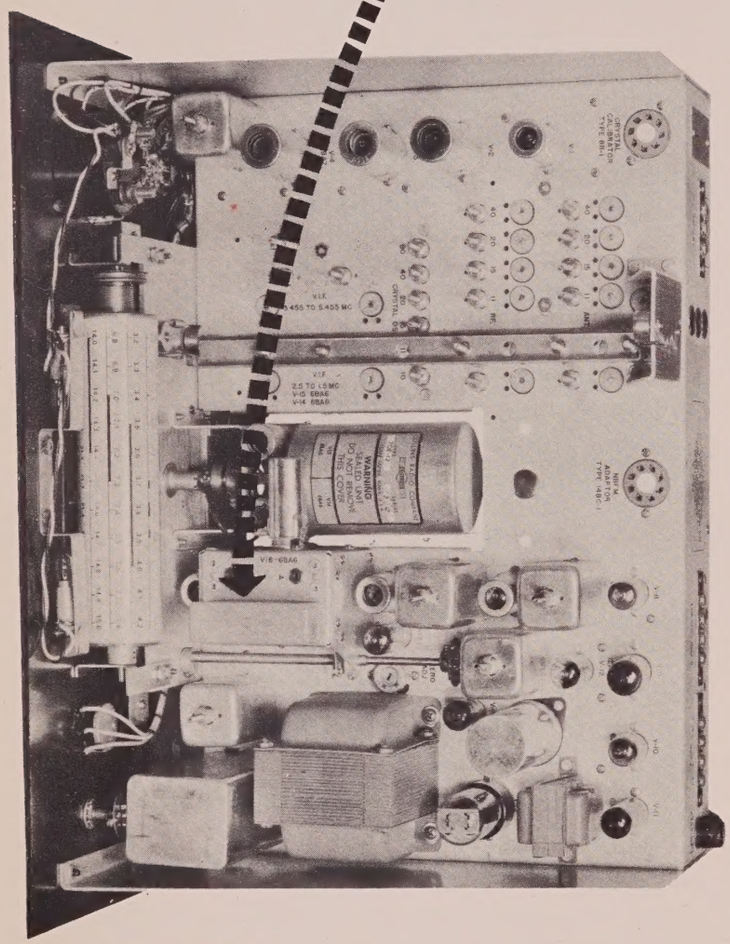
As can be seen in the block diagram, the 75A-3 with its crystal-controlled front-end and highly stable variable-frequency oscillator, is like a high-frequency crystal-controlled converter working into a very stable low-frequency receiver.

BANDSPREAD

All coils are permeability tuned and have a straight-line frequency characteristic allowing linear dial calibration. The receiver has two frequency scales. A slide-rule dial shows only the band in use and is marked in 100-kc. divisions. The second dial, directly coupled to the tuning knob, is marked in 1 kc. divisions for all bands except 10 and 11 meters, where each division represents 2 kc.

Top view of 75A-3 showing one mechanical filter and socket for another





SENSITIVITY

Sensitivity of 2 microvolts or better for a 10 db. signal-to-noise ratio is made possible by the 6CB6 r.f. stage in the 75A-3. A 10 db. signal-to-noise ratio and 1 watt of audio output is obtained on all bands with signal inputs of 2 microvolts or less.

NOISE LIMITERS

The phone noise limiter is a series-type clipper which automatically adjusts to all signal levels. Also, a full wave, shunt-type noise limiter with front panel control of limiting level is provided for c.w. operation.

STABILITY

Three factors contribute to the very high accuracy and stability of the 75A-3:

(1) the use of precision quartz crystals in the first conversion circuit, (2) the inherent accuracy and stability of the v.f.o. in the second conversion circuit, and (3) linearity and absence of backlash in the tuning mechanism. In order to take advantage of this precision, a secondary frequency standard, continually checked against WWV, is utilized in the factory calibration. The 75A-3 calibration is accurate to within 1 kc. except at 10 and 11 meters where it is accurate to within 2 kc.

The stability is such that on c.w. reception extreme variation in the supply voltage causes a change of only a few cycles in the note. Furthermore, the c.w. note is almost independent of all except the tuning controls. Physical shock will not disturb the frequency unless the shock is severe enough to change the dial settings. This outstanding stability, which is available without a long warm-up period, makes the 75A-3 an ideal s.s.s.c. receiver.

IMAGE REJECTION

The circuit design of the 75A-3 receiver has inherently high rejection to spurious frequencies. Image rejection is a minimum of 50 db.

SIGNAL STRENGTH METER

The S-meter is calibrated from 1 to 9 in steps of approximately 6 db. each, and for 20, 40, and 60 db above S9. A reading of S9 corresponds to a signal input of 100 microvolts. Zero adjustment is provided.

AUTOMATIC VOLUME CONTROL

Constant output within 6 db. is obtained for a change in r.f. input from 5 microvolts to 0.2 volts. A.v.c. is applied to the r.f. and i.f. stages. The a.v.c. amplifier tube works into an unusually low value of load impedance which permits quick recovery from strong noise pulses.

ANTENNA COUPLING

The antenna input impedance is in the order of 50 to 150 ohms and will accommodate both balanced and unbalanced lines.

AUDIO OUTPUT

Maximum audio output power is more than 1.5 watts. 500 ohm and 4 ohm output terminals are provided, as well as a phone jack. The speaker is in a matching cabinet.

CONTROLS

The following controls are on the 75A-3 front panel:

Tuning	Crystal Selectivity
Zero Set	Crystal Phasing
Bandswitch	Mechanical Filter Selector
RF Gain	
Audio Gain	CW-AM-FM Switch
BFO Pitch	Noise Limiter — Calibrate Switch
CW Limiter	
Antenna Trimmer	On-Off-Standby Switch

FREQUENCY COVERAGE

160 meters—1.5 to 2.5 mc.
80 meters—3.2 to 4.2 mc.
40 meters—6.8 to 7.8 mc.
20 meters—14.0 to 15.0 mc.
15 meters—20.8 to 21.8 mc.
11 meters—26.0 to 28.0 mc.
10 meters—28.0 to 30.0 mc.

DIMENSIONS AND WEIGHT

Cabinet size is 21-1/8" wide, 12-1/2" high, 13-1/16" deep. The chassis is mounted on a 19" panel which can be removed from the cabinet and mounted in a standard relay rack. The 75A-3 weighs approximately 50 pounds.

POWER SOURCE

The self-contained power supply requires 115 volts 50/60 c.p.s. a.c.

NET PRICE

75A-3 receiver complete with 3 kc mechanical filter, tubes, and instruction book (exclusive of state tax but including excise tax).

Net domestic price.....$530.00

10" matching speaker and cabinet assembly.

Net domestic price.....$ 20.00

Type F455B-08 800-cycle mechanical filter plug-in unit.

Net domestic price.....$ 75.00

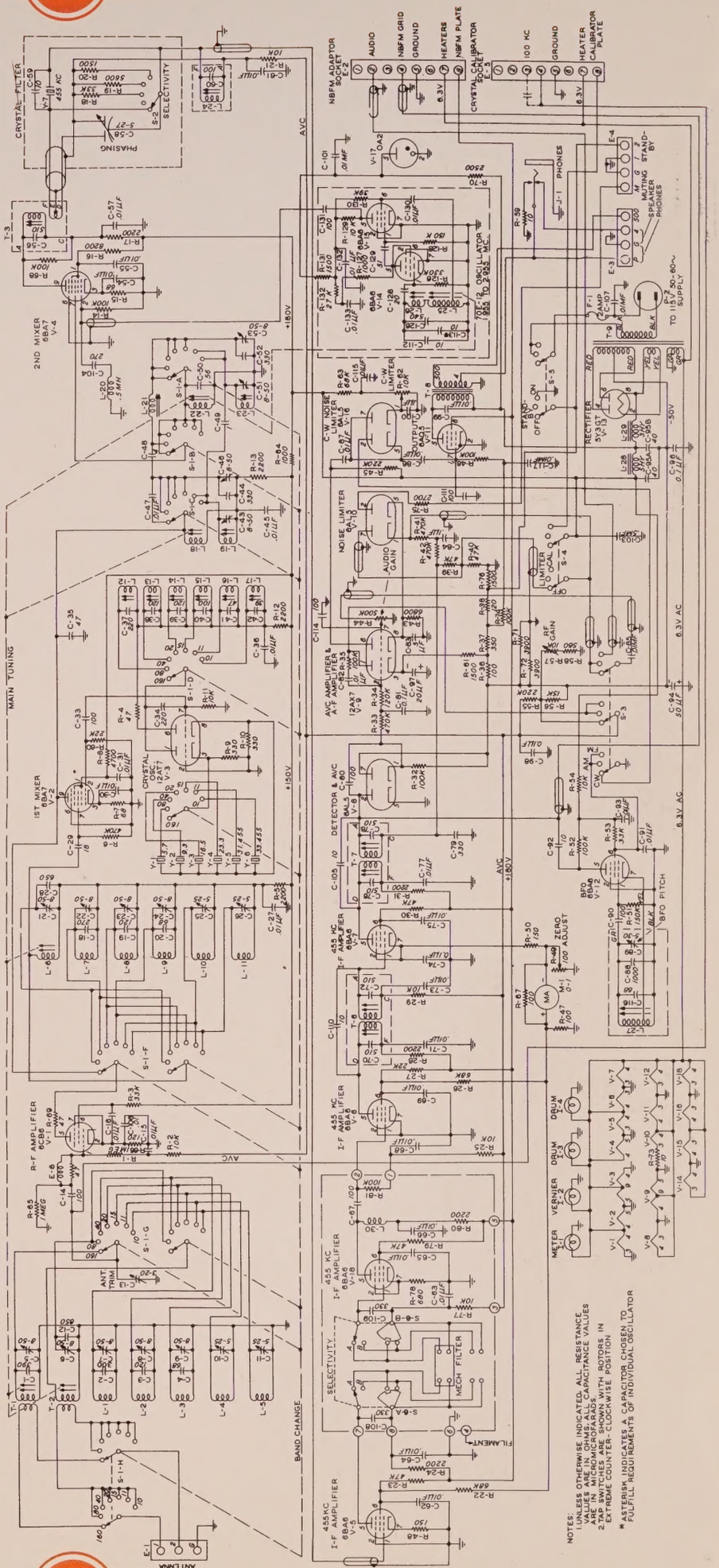
ATTENTION 75A-2 OWNERS

You can return your receiver through your distributor for factory modification to incorporate the new mechanical filter arrangement. Modification consists of the installation of a mechanical filter conversion kit complete with a 3 kc filter, minor repairs, and complete realignment of the equipment. For full information regarding this service, contact your authorized Collins distributor.

Net domestic price.....$125.00

75A-2 owners who wish to modify their own sets can obtain conversion kits, complete with instructions and a 3 kc mechanical filter, from their Collins distributors.

Net domestic price.....$100.00


NOTES:
1. UNLESS OTHERWISE INDICATED, ALL RESISTANCE VALUES ARE IN OHMS, ALL CAPACITANCE VALUES ARE IN MICROFARADS.
2. TAP SWITCHES ARE SHOWN WITH ROTORS IN EXTREME COUNTER-CLOCKWISE POSITION
* ASTERISK INDICATES A CAPACITOR CHOSEN TO FULFILL REQUIREMENTS OF INDIVIDUAL OSCILLATOR

Collins Professional Gear for the Amateur

COLLINS DEPENDABLE
75A-2 Receiver

The 75A-2 features high sensitivity, exceptional selectivity, stability, and dial accuracy. This popular double conversion superheterodyne receiver is designed for superior performance on the 160, 80, 40, 20, 15, 11 and 10 meter bands.

Net domestic price **$420.00**

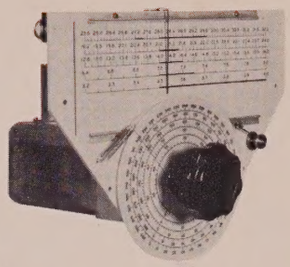
10" Matching Speaker and Cabinet Assembly
Net domestic price ..... **$ 20.00**

KW-1
Transmitter

The new Collins KW-1 Transmitter is engineered to equip the amateur for use of the maximum power permitted. Its imput is a full, cool 1000 watts on phone and CW. Frequency range covers the 160, 80, 40, 20, 15, 11 and 10 meter bands. Only four tuning functions are required in operation: bandswitch selection, frequency setting, PA tuning and PA loading.

Spurious radiation is reduced to a very low value, particularly on TV frequencies. Great care has been given to filtering all control and power leads entering the exciter-power amplifier compartment, which is itself a totally enclosed and shielded structure.

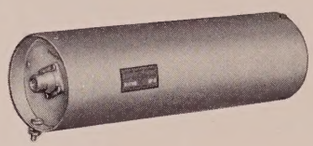
Net domestic price .. **$3850.00**



70E-8A VFO

Its versatility, ease of operation, accuracy and highly stable output will give your rig or measuring instruments a truly professional performance. This oscillator is permeability tuned, and has a linear range of 1600 kc. - 2000 kc. Sixteen turns of the vernier dial are required to cover the 400 kc. range.

Net domestic price **$97.50**



35C-2 Filter

The 35C-2 is a 52 ohm three-section low-pass filter with approximately 0.2 db. insertion loss below 29.7 mc and approximately 75 db. attenuation of harmonic emmissions at the television frequencies.

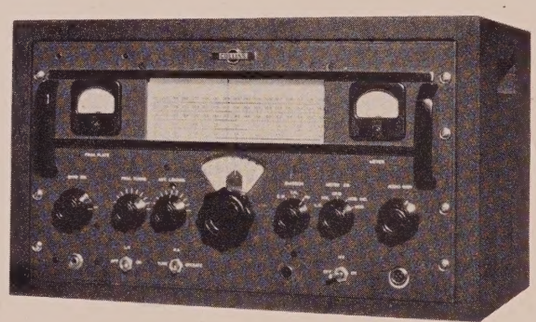
Net domestic price **$40.00**

8R-1 and 148C-1

The 8R-1 100 kc. crystal calibrator and the 148C-1 NBFM adapter are available as 75A-2 and 75A-3 accessories, for plugging into completely wired sockets on the top of the chassis. The operation of both units may be controlled by switches located on the front panel.

8R-1 plug-in crystal calibrator
Net domestic price **$25.00**

148C-1 plug-in NBFM adapter
Net domestic price **$20.00**



32V-3 Transmitter

This is a VFO controlled bandswitching gang-tuned amateur transmitter, conservatively rated at 150 watts imput on CW and 120 watts imput on phone. It covers the 80, 40, 20, 15, 11 and 10 meter bands, and is specifically engineered for reduction of TVI.

The entire r-f section of the 32V-3 has been completely enclosed in an outer shield of perforated metal permitting adequate ventilation while blocking radiation of troublesome harmonics.

Net domestic price **$775.00**

FOR THE BEST IN AMATEUR RADIO, IT'S . . .

COLLINS

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

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